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ORIGINAL PAPER - PRODUCTION ENGINEERING

Rate transient analysis of Well-07 and Well-10 of Habiganj gas field, Bangladesh

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Abstract Rate transient analysis (RTA) plays a significant role in the research and development sector of petroleum industry to know about the reserves and physical properties of commercially expected hydrocarbon fluids of a petroleum field. In this research, to conduct a rate transient analysis study; reservoir properties, well properties and Production data over the year of 2007 from two gas producing wells, Well-07 and Well-10 of Habiganj gas field, Bangladesh were used. There are two gas zones in this gas field: upper gas sand (UGS) and lower gas sand (LGS). Only UGS was considered as a gas reservoir in this research work due to no producing well in LGS. Software FEKETE, F.A.S.T.RTA^{TM} (version 4.5.1.277), IHS Inc. was used to conduct this research. The objectives of this research were to estimate gas initially in place (GIIP) and expected ultimate recovery (EUR) of Well-07 and Well-10, to determine permeability and skin surrounding each of these two producing wells. After completion of the analysis, the GIIP and EUR values of Well-07 were estimated to 435.082 billion cubic feet (Bcf) and 304.558 Bcf, and those of 475.242 Bcf and 332.67 Bcf of Well-10, respectively. Skin effect and permeability in the surrounding of each of these producing wells were amounted to 7.017 and 3.0396 millidarcy (md) for Well-07 and those of 7.014 and 2.7839 md for Well-10, respectively, by the end of the year of 2007.

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Keywords Rate transient analysis · Habiganj gas field · Typecurve analysis · Decline curve analysis · Gas initially in place · Expected ultimate recovery · Skin · Permeability

List of symbols

F	Fahrenheit
S	Skin factor
S_d	Skin effect due to well drilling and completion
S_{PT}	Pseudo-skin factor resulted from reservoir open level
S_{PF}	Pseudo-skin factor due to perforation
r_s	Radius of the altered zone due to skin
k_s	Permeability of the altered zone due to skin
k	Permeability of the reservoir (md)
r_w	Wellbore radius
r_e	Radius of the reservoir
Δp_s	Additional pressure drop due to skin effect
μ	Viscosity
q	Production rate (MMScfd)
Δp_p	Pseudo-pressure difference (psi)
P_{pwf}	Bottomhole pseudo-pressure (psi)
$Q = G$	Cumulative production (Bcf)
Q_G	Cumulative gas production (Bcf)
t_c	Material-balance time
t_{ca}	Material-balance pseudo-time
μ_g	Viscosity of gas
c_g	Compressibility of gas (psi^{-1})
q_g	Gas production rate (mmcfd)
t	Time (day)
r_{ed}	Dimensionless radius of the reservoir
t_{Dd}	Dimensionless time
q_{Dd}	Dimensionless rate
h	Net pay thickness of the reservoir (ft)
C_t	Total compressibility (psi^{-1})
P_i	Initial pressure (psi)

P_{pi}	Initial pseudo-pressure (psi)
P_{wf}	Wellbore flowing pressure (psi)
P_{pwf}	Wellbore flowing pseudo-pressure (psi)
t_{dA}	Dimemsionless radius
A	Area (ft^2)
B	Formation volume factor

Abbreviations

A–G	Agarwal–Gardner
Bcf	Billion cubic feet
BGFCL	Bangladesh Gas Field Company Limited
DCA	Decline curve analysis
EUR	Expected ultimate recovery
FWHP	Flowing well head pressure
GIIP	Gas initially in place/gas initial in place
GWC	Gas water contact
Inc.	Incorporation
IKM	Intercomp-Kanata Management Limited
km	Kilo meter
LGS	Lower gas sand
md	Millidarcy
NPI	Normalized pressure integral
PDA	Production data analysis
PTA	Pressure transient analysis
RTA	Rate transient analysis
SPE	Society of Petroleum Engineers
Tcf	Trillion cubic feet
UGS	Upper gas sand
Well-07	Production Well no. 07 drilled in chronological order
Well-10	Production Well no. 10 drilled in chronological order

Introduction

Habiganj gas field, Bangladesh, was the study area to carry out this research. This gas field is located at Madhabpur Upazila, Habiganj District, about 100 kilo meter (km) away to the direction of northeastern from Dhaka (capital city of Bangladesh). This gas field lies about 32 km northeast of Titas gas field, the largest reserved gas field in Bangladesh. This gas field was discovered by shell Oil Company in 1963 and has been one of the major gas producers in Bangladesh (Imam 2013; Bangladesh Gas Fields Company Limited [BGFCL] 2014). Figure 1 shows the location of Habiganj gas field in Habiganj District in Bangladesh. It is the third-largest gas producer in the country and operated by Bangladesh Gas Field Company Ltd (BGFCL), a subsidiary of Bangladesh Oil, Gas and Mineral Corporation (known as Petrobangla) (Imam 2005).

There are two gas zones, upper gas sand (UGS) and lower gas sand (LGS). These two zones are sandstone formations. The UGS is the primary gas reservoir of the gas field and lies at a depth of 1320 m below the surface. It has a maximum gross pay of 230 m thick. The gas sand is medium to fine grained, well sorted, clean and unconsolidated. It has an average porosity of 30 % and average permeability in the range of 2–4 darcy (Imam 2013). Figure 2 represents the cross section of the subsurface of Habiganj gas field, Bangladesh.

According to Haq and Gomes (2001), Intercomp-Kanata Management Limited (IKM) Reservoir Engineering Report (1990) stated that the recovery from the UGS in the Habiganj gas field is dominated by the water drive mechanism and the aquifer to be ten times extensive than the reservoir. Hartmann and Beaumont (2016) says that water drive mechanism exists only where the aquifer is of equal or better quality and has a much larger volume than the reservoir (about 10 times).

Rate transient analysis

Rate transient analysis (RTA) is the science of analyzing production data (both rates and flowing pressures). This method is an important tool to estimate reserve of oil and/or gas of a reservoir. Reserve estimation and development planning are the key tasks of petroleum engineers by the use of historical production (reservoir fluid production rate histories and cumulative production). Both of these fall within the domain of a quantitative production data analysis (PDA) (Help Manual 2010; Clarkson et al. 2012; Clarkson 2013).

RTA can also be defined as a modern decline curve analysis (DCA) method (Mishra 2014). DCA method is one of the oldest and most often used tools of the petroleum engineers. This is a forecasting technique which predicts by history matching of rate-time data on an appropriate typecurve. What direction to take, what typecurve(s) to choose and where the rate-time data should fit are decided based on basic reservoir engineering concepts and knowledge (Fetkovich 1980; Fetkovich et al. 1987). So DCA is not based on applying a purely empirical equation to be analyzed with statistical approaches which often leads to unrealistic and unreliable forecast and reserve estimate (Fetkovich et al. 1996).

RTA also gives convincing estimates of reservoir parameters with available low-frequency (weekly or monthly) production data. Once reservoir characteristics are determined using RTA, a reservoir model is then constructed to forecast future production scenarios (Mishra 2014; Mireault and Dean 2007–2008).

Typecurve analysis

According to Ley and Samaniego (1981), a considerable amount of information concerning well test analysis

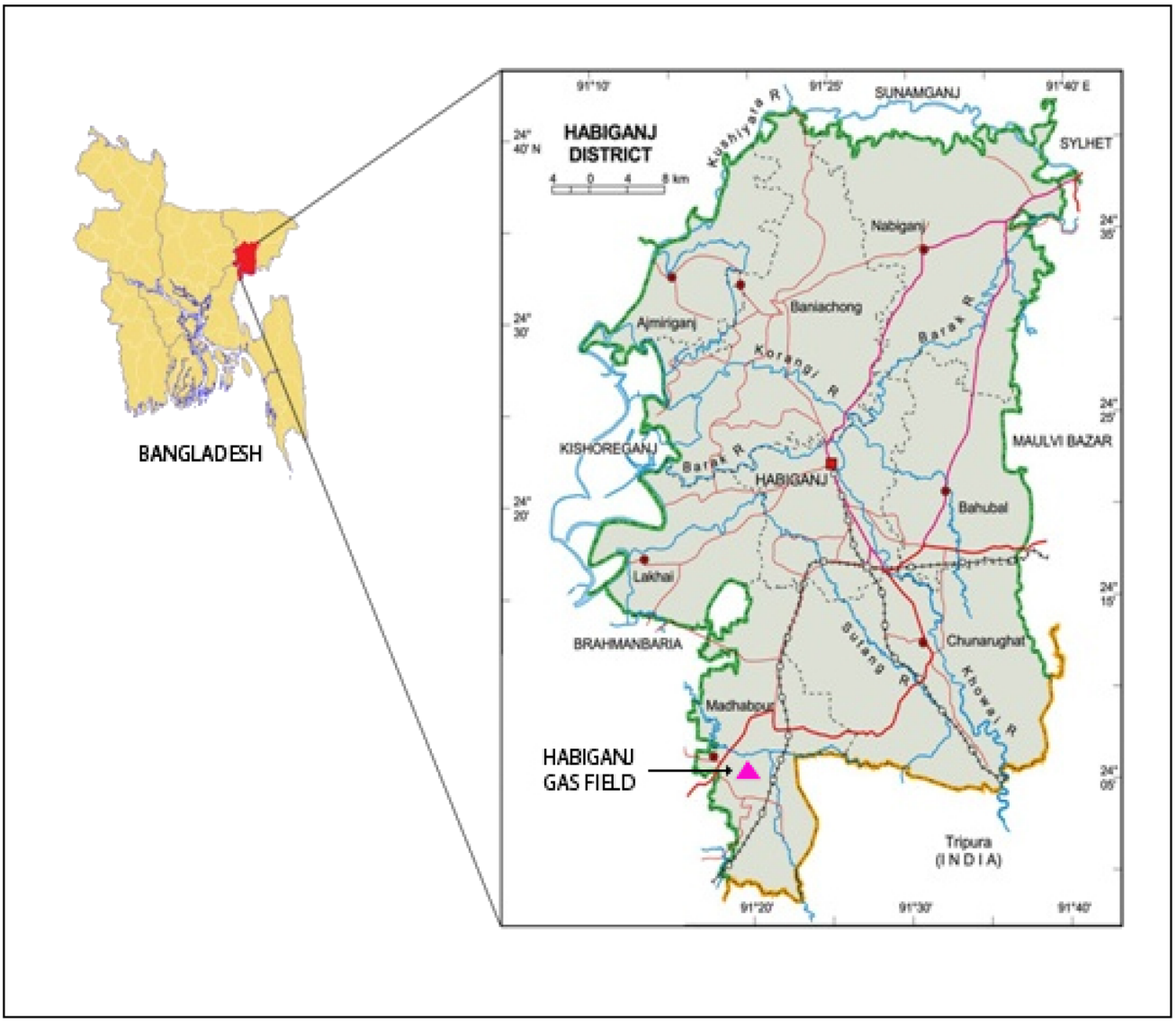

Fig. 1 Location of Habiganj gas field, Bangladesh Source: Wikipedia

has been in the literature over the last several decades. Typecurve analysis consists of finding a typecurve that matches the actual response of the well and the reservoir during the test. Then the reservoir and well parameters, such as permeability and skin, can be calculated from the dimensionless parameters defining that typecurve (Gringarten 1987).

Gas initial in place and expected ultimate recovery

Gas initial in place (GIIP) refers to the total amount of gas present initially in the underground of a gas field. Part of the GIIP in an explored gas field can be recovered. Generally, the recovery of gas from the GIIP in a typical gas field ranges from as low as 60 % to as high as 90 % (Imam 2013).

Expected ultimate recovery (EUR) of a petroleum source is the sum of the proven reserve at a specific time and the cumulative production up to that time. Proven reserve refers to the quantity of gas in a gas reservoir which can be estimated with reasonable certainty (high degree of confidence) to be commercially recoverable from known reservoir under the present economic and operating conditions (Imam 2013; Morehouse 1997).

Permeability and skin

Permeability (k) in a reservoir rock is its capacity to transport fluids through a system of interconnected pores. Reservoir permeability is a random-valued property of the formation (Zolotukhin and Ursin 2000; Jensen et al. 1987).

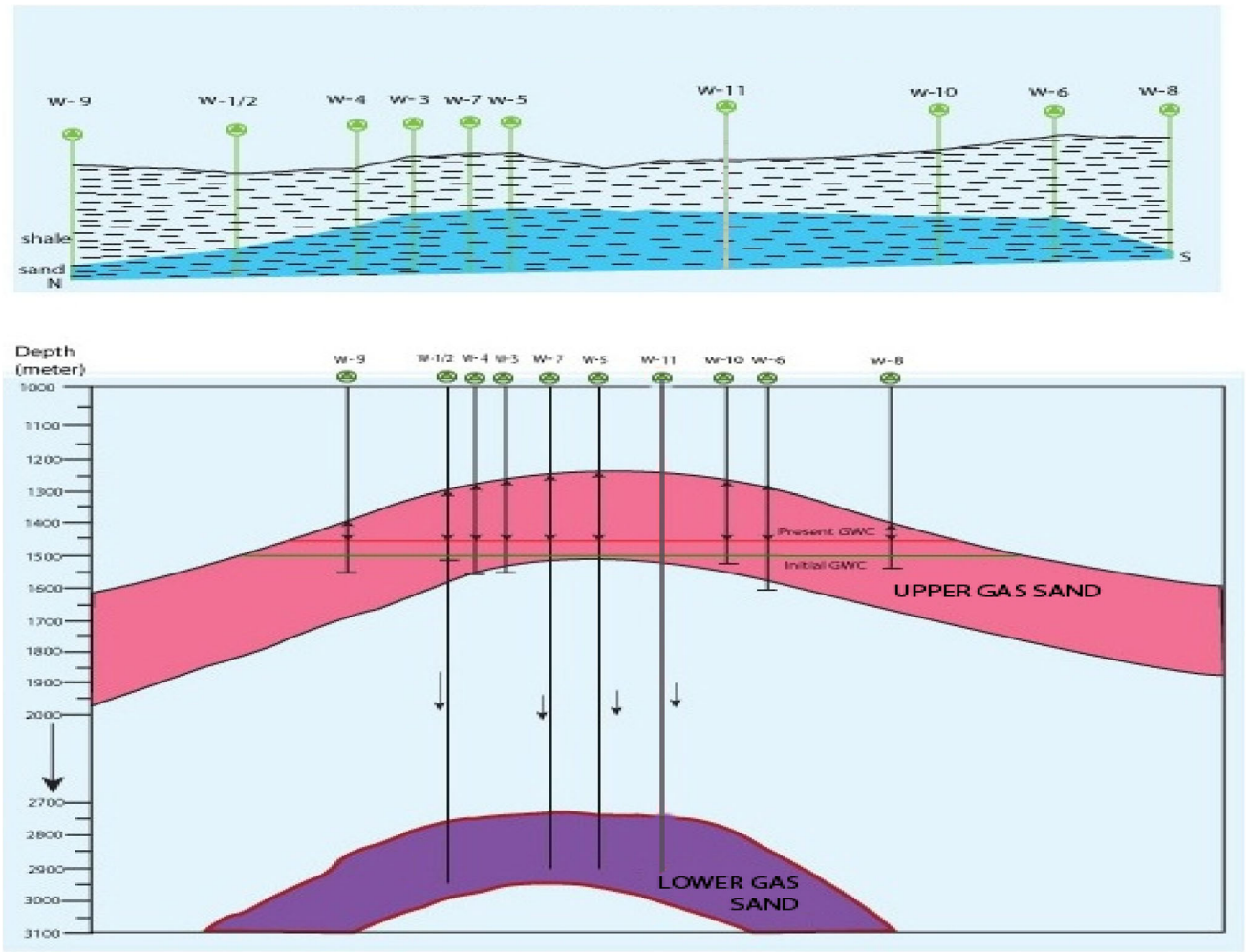

Fig. 2 Cross-sectional view of the subsurface of Habiganj gas field, Bangladesh (Imam 2013)

The pressure drop in a well per unit rate of flow is controlled by the resistance of the formation, the viscosity of the fluid, and the additional resistance concentrated around the wellbore due to drilling, completion and production practices. The pressure drop caused by this additional resistance is defined as the skin effect, denoted by the symbol S. The reservoir damage occurs because of this skin effect. Reservoir damage is resulted from well drilling and completion (S_d), pseudo-skin factor resulted from reservoir open level (S_{PT}) and pseudo-skin factor resulted from perforation (S_{PF}) and several other skin factors (Everdingen 1953; Jianchun et al. 2014).

A two-region reservoir model (Fig. 3) represents a damaged well. In this model, the altered zone around the wellbore is assumed to have uniform permeability k_s out to a radius r_s, beyond which the formation permeability, k, is unaltered (Altered zone and skin effect 2016). Everdingen found that better agreement between theory and well performance is possible, if the permeability

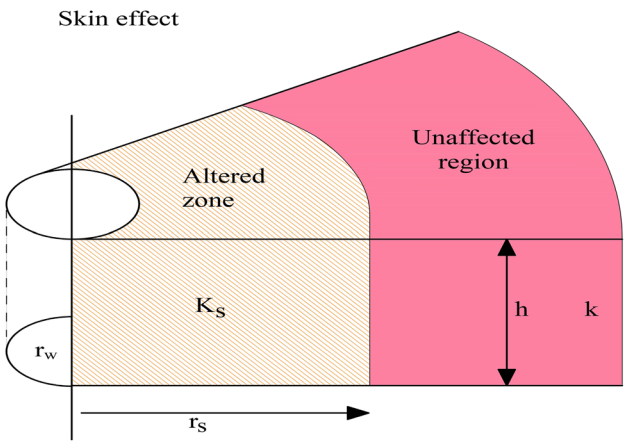

Fig. 3 Two-region reservoir model (Altered zone and skin effect 2016)

reduction near the wellbore region is assumed due to drilling, completion and production practices (Hawkins Jr. 1956).

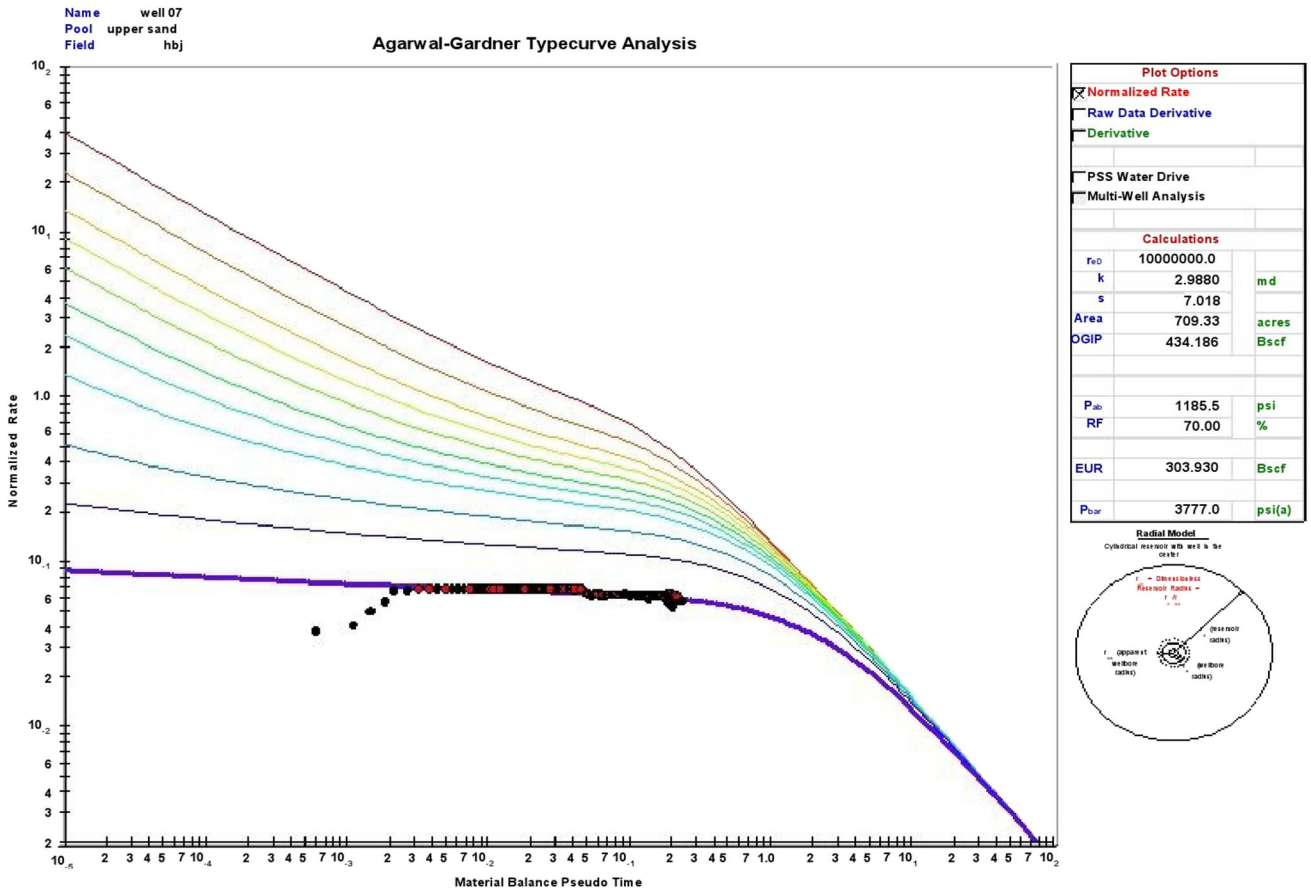

Fig. 4 Match between data plot for Well-07 and Agarwal–Gardner typecurve plot

Materials and methods

Data (reservoir properties, fluid properties, properties of Well-07 and Well-10, and production data of Well-07 and Well-10 for the year of 2007) were collected from BGFCL, a subsidiary of Petrobangla for this study. By using software FEKETE, F.A.S.T.RTA^{TM}, methods such as Blasingame typecurve analysis, Agarwal–Gardner typecurve analysis and normalized pressure integral (NPI) typecurve analysis were followed. After entering data into the software, data points in the graph were seemed to be very scattered. It was essential to be filtered. To minimize error and to obtain a good match between typecurves and data plot, data points in the graph of the software were filtered to clean up "noise" and to reduce data which were scattered.

The major assumptions in this work were as follows:

1 The reservoir is assumed to be homogeneous.
2 The reservoir is circular of radius r_e.
3 The fluid is of constant viscosity, μ.
4 Radial flow of fluids.

Required data for the study

The required reservoir, fluid and well properties are numerated below. A table concerning the report of daily flowing well head pressure (FWHP) and daily production of gas and water for the year of 2007 are presented in Appendices 1 and 2 section in this paper.

Reservoir properties

Producing zone: upper gas sand
Porosity: 30 %
Reservoir temp: 178 degree F

Fluid properties

Fluid type: gas
Fluid used for static calculation: gas

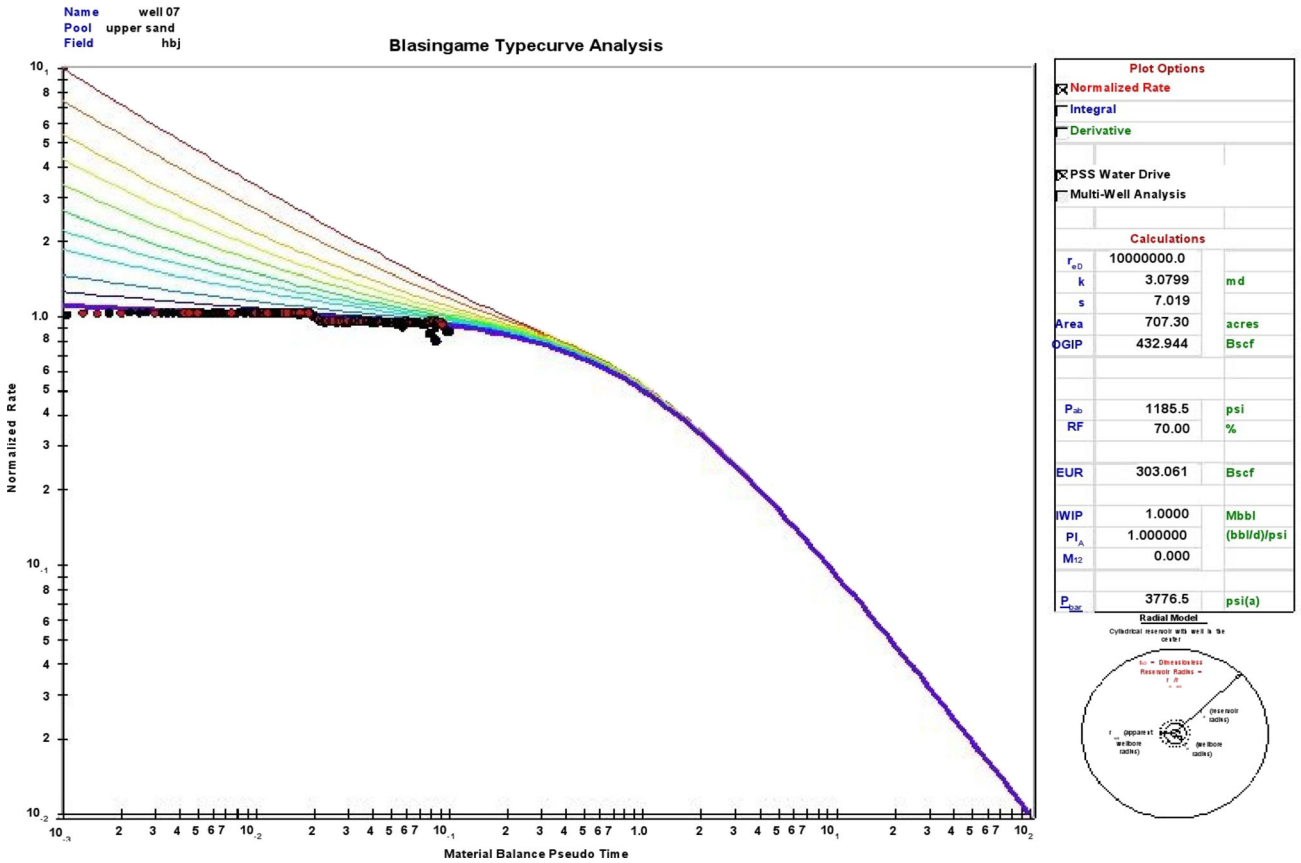

Fig. 5 Match between data plot for Well-07 and Blasingame typecurve plot

Properties of Well-07

Well type: vertical
Perforation interval: 4347–4600 ft
Midpoint perforation: 4473.5 ft
Tubing size: 4.5 in
R_w: 0.350 ft
Casing (ID): 7 in
Static Well head temp: 75 degree F (avg)
Flowing Well head temperature: 95 degree F (avg)

Properties of Well-10

Well type: vertical
Perforation interval: 4373–4649 ft
Midpoint perforation: 4511 ft
Tubing size: 4.5 in
R_w: 0.350 ft
Porosity: 30 %
Casing (ID): 7 in
Static Well head temp: 75 degree F (avg)
Flowing Well head temperature: 95 degree F (avg)

Blasingame typecurve analysis

At Blasingame method (Help Manual 2010), the normalized rate was plotted against material-balance pseudo-time on a log–log scale of the same size as the typecurves, which are referred as the "data plot".

$$\text{For data plot, normalized rate, } \frac{q}{\Delta p_p} = \frac{q}{(p_i - p_{pwf})}$$

$$\text{Material balance time } t_c = \frac{Q}{q}$$

Application of this concept to oil would be very straight forward. To gas, it is more complex because of varying PVT properties of gas. Accordingly simple concept $t_c = \frac{G_g}{q_g}$ must be defined in terms of pseudo-time,

$$t_{ca} = \left\{\frac{(\mu_g c_g)_j}{q_g}\right\} \int_o^t \left\{\frac{q_g}{\mu_{gav} c_{gav}}\right\} dt$$

Blasingame et al. established his typecurves using dimensionless rate (q_{Dd}) against dimensionless time (t_{Dd}) on a log–log scale.

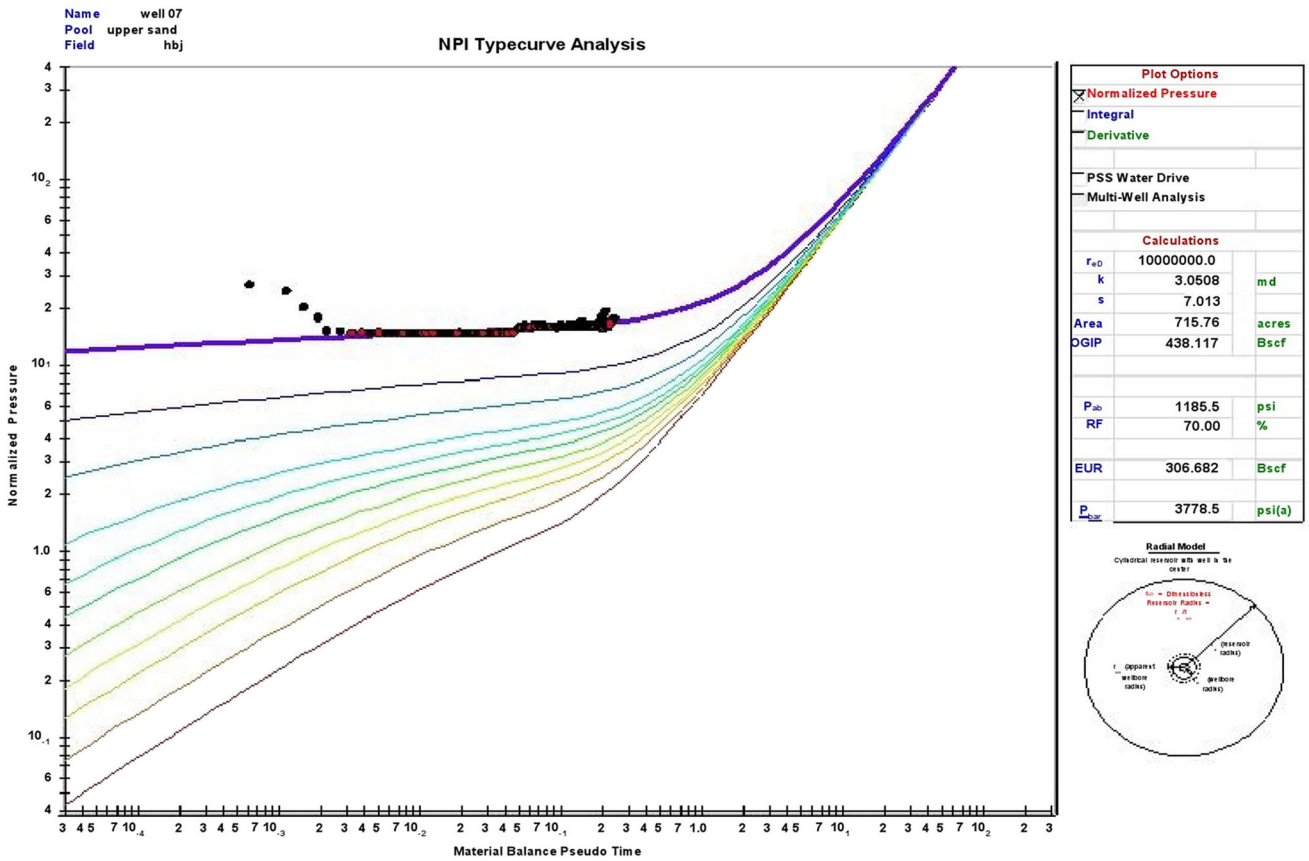

Fig. 6 Match between data plot for Well-07 and NPI typecurve plot

$$q_{\mathrm{Dd}} = q_{\mathrm{d}} \ln(r_{\mathrm{eD}} - 0.5), r_{\mathrm{eD}} = \frac{r_{\mathrm{e}}}{r_{\mathrm{w}}}$$

$$t_{\mathrm{Dd}} = \frac{2t_d}{\{(\ln r_{\mathrm{eD}}) - 0.5)(r_{\mathrm{eD}}^2 - 1)\}}$$

Agarwal–Gardner typecurve analysis

At Agarwal–Gardner method (Help Manual 2010), the procedure is almost similar to the Blasingame with a few dissimilarities. As opposed to Blasingame, here for data plot,

$$\text{Normalized rate}, \frac{q}{\Delta p_{\mathrm{p}}} = \frac{q}{(p_{\mathrm{i}} - p_{\mathrm{pwf}})}$$

$$\text{Material balance pseudo time}, t_{\mathrm{ca}} = \left\{\frac{(\mu_{\mathrm{g}} c_{\mathrm{g}})_j}{q_{\mathrm{g}}}\right\} \int_o^t \left\{\frac{q_{\mathrm{g}}}{\mu_{\mathrm{gav}} c_{\mathrm{gav}}}\right\} \mathrm{d}t$$

Agarwal et al. established his typecurves using dimensionless rate (q_{Dd}) against dimensionless time (t_{Dd}) on a log–log scale as,

$$q_{\mathrm{D}} = \frac{1}{p_{\mathrm{D}}} = 141.2 \frac{qB\mu}{\{kh(p_{\mathrm{i}} - p_{\mathrm{wf}})\}}$$

$$t_{\mathrm{DA}} = \frac{0.00633kt}{\varphi \mu c_t A}$$

Normalized pressure integral typecurve analysis

In case of NPI (Help Manual 2010), the normalized pressure replacing normalized rate was plotted against material-balance pseudo-time on a log–log scale of the same size as the typecurves, which are referred as the "data plot".

$$\text{Normalized pressure}, \frac{\Delta p_{\mathrm{p}}}{q} = \frac{(p_{\mathrm{pi}} - p_{\mathrm{wf}})}{q}$$

$$\text{Material balance pseudo time}, t_{\mathrm{ca}} = \left\{\frac{(\mu_{\mathrm{g}} c_{\mathrm{g}})_j}{q_{\mathrm{g}}}\right\} \int_o^t \left\{\frac{q_{\mathrm{g}}}{\mu_{\mathrm{gav}} c_{\mathrm{gav}}}\right\} \mathrm{d}t$$

NPI typecurves were developed by dimensionless pressure (p_{d}) against dimensionless time (t_{d}) on a log–log scale.

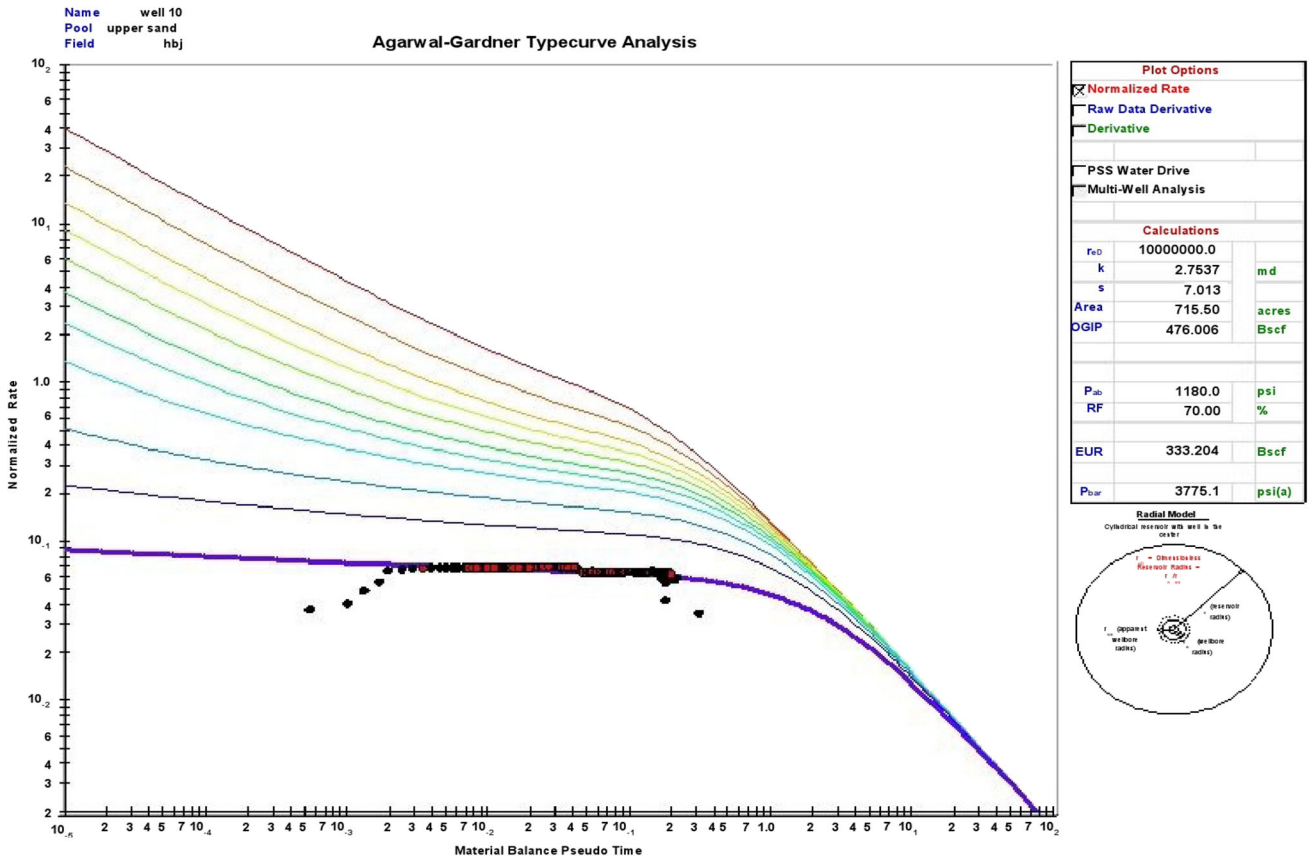

Fig. 7 Match between data plot for Well-10 and Agarwal–Gardner typecurve plot

$$p_{\mathrm{D}} = \frac{1}{q_{\mathrm{D}}} = \frac{\{kh(p_{\mathrm{i}} - p_{\mathrm{wf}})\}}{141.2qB\mu}$$

$$t_{\mathrm{DA}} = \frac{0.00633kt}{\varphi\mu c_{\mathrm{t}}A}$$

Analysis procedure

After entering data in the software FEKETE, F.A.S.T.RTA$^{\mathrm{TM}}$, instruction of the Help Manual was followed. According to the Help Manual, typecurve analysis is generally done by selecting a match point and reading its coordinates off the data plot ($\frac{q}{p}$ and t_{ca}) and off the typecurve plot (q_{Dd} and t_{Dd}) match. At the same time, the stem value $\frac{r_{\mathrm{e}}}{r_{\mathrm{w}}}$ of the matching curve is noted. In this study, data plot was moved over the typecurve plot to get the optimum match, while the axis of the two plots was kept parallel. Several positions of the several typecurves were tried and typecurve that fitted the data plot best was selected. From a curve match, the following reservoir parameters were found from the output of the software: GIIP, EUR, permeability and skin.

Results and discussions

Using three methods, graph of the match between data plot and individual typecurves are presented in Figs. 4, 5, 6 for Well-07 and Figs. 7, 8, 9 for Well-10, respectively. To get the optimum value of the results, three methods were averaged.

GIIP and EUR

GIIP of Well-07 is shown in Figs. 4, 5, 6 and of Well-10 is shown in Figs. 7, 8, 9, respectively. Table 1 shows the findings of GIIP values of Well-07 to be 435.082 Bcf and of Well-10 is 475.242 Bcf, respectively, obtained from FEKETE, F.A.S.T.RTA$^{\mathrm{TM}}$. It could be said that the difference of GIIP between these two wells is very small.

EUR of Well-07 is shown in Figs. 4, 5, 6 and of Well-10 is shown in Figs. 7, 8, 9, respectively. As shown in Table 2, the EUR value of Well-07 and Well-10 obtained from FEKETE, F.A.S.T.RTA$^{\mathrm{TM}}$ was projected to be

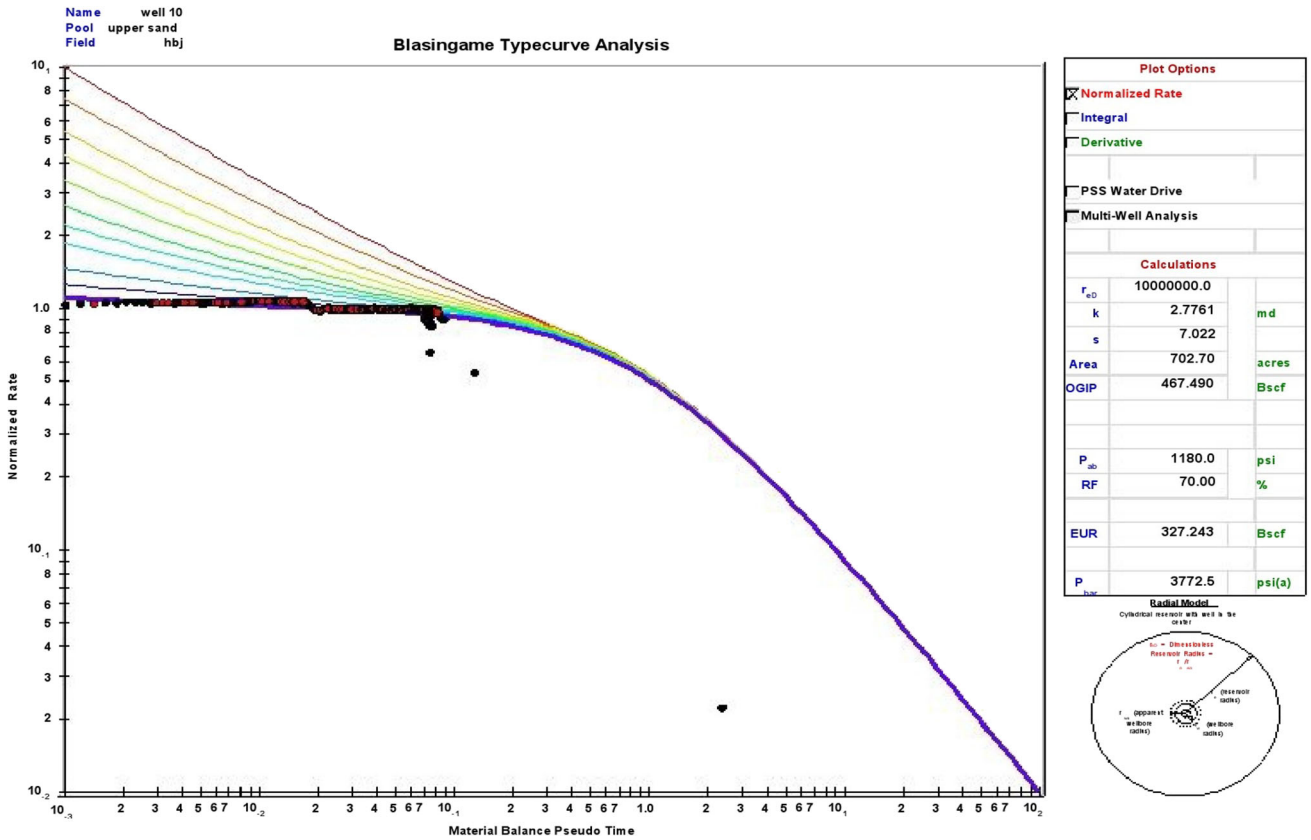

Fig. 8 Match between data plot for Well-10 and Blasingame typecurve plot

304.558 Bcf and 332.67 Bcf, respectively. This result suggests that only this amount of reserve from GIIP of these two wells mentioned above is commercially recoverable by primary recovery.

Skin and permeability

The value of permeability (k) in the wellbore region of the Well-07 is illustrated in Figs. 4, 5, 6 and of Well-10 in Figs. 7, 8, 9, respectively. According to Table 3, permeability was estimated to 3.0396 md and 2.7839 md surrounding the Well-07 and Well-10, respectively, at the end of the year of 2007.

The value of the skin effect (dimensionless parameter) is depicted in Figs. 4, 5, 6 for Well-07 and for Well-10 in Figs. 7, 8, 9, respectively. As shown in Table 4, reservoir was damaged due to skin in surrounding region of the Well-07 was valued by 7.017 and of Well-10 was 7.014, respectively.

Comparison with previous studies

Imam (2013) stated that the average permeability (k) value of UGS of Habiganj gas field was found to be 2–4 darcy. But from this study, the permeability (k) value of UGS of Habiganj gas field was obtained to 3.0396 md and 2.7839 md surrounding Well-07 and Well-10, respectively. Additionally, the dimensionless value of skin factor (s) was estimated surrounding the Well-07 and Well-10 to 7.017 and 7.014, respectively. So, permeability near these two wellbore regions was substantially reduced as a result of the highly valued skin effect as recommended by Hawkins Jr. (1956). This reduced permeability causes an additional pressure drop across the altered zone.

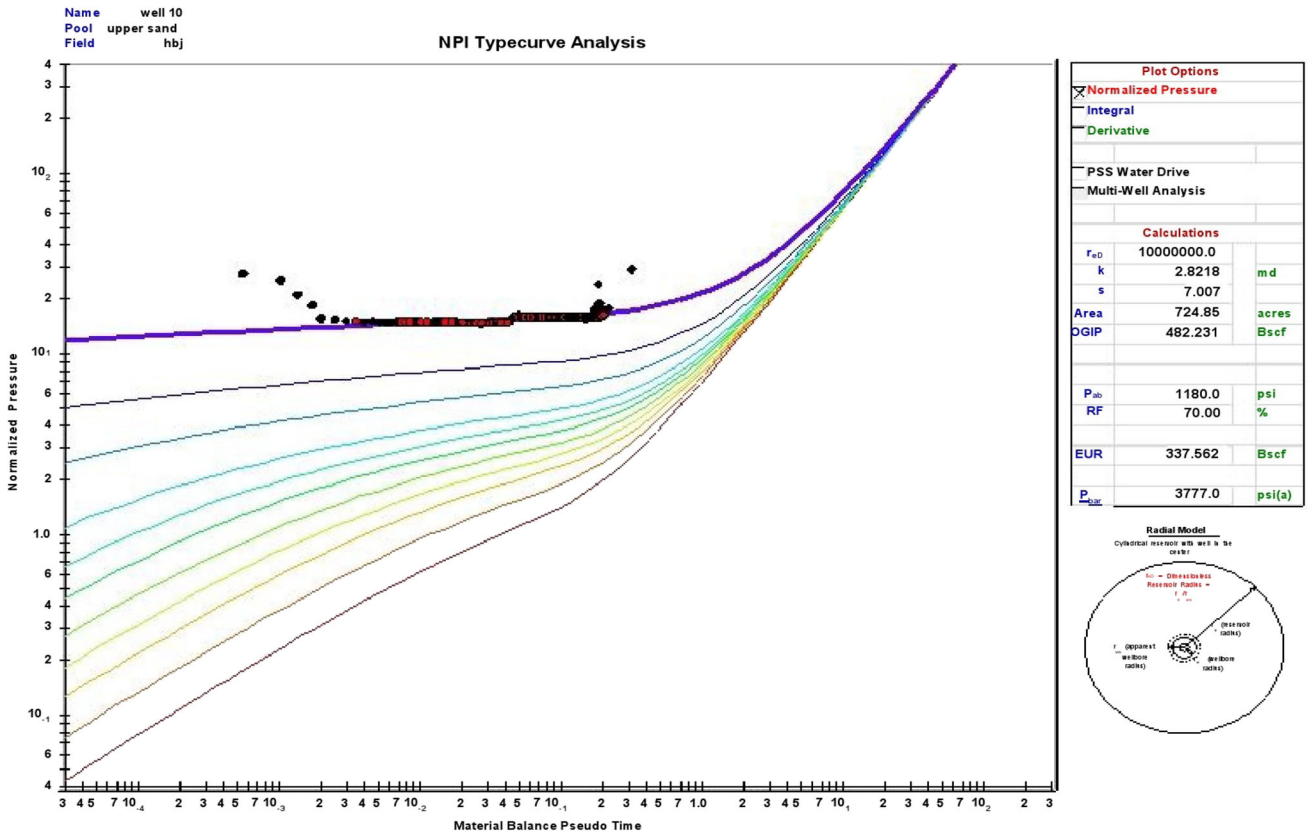

Fig. 9 Match between data plot for Well-10 and NPI typecurve plot

Table 1 GIIP of Well-07 and Well-10

Well	Blasingame (Bcf)	Agarwal–Gardner (Bcf)	Normalized pressure integral (Bcf)	Average (Bcf)
Well-07	432.944	434.186	438.117	435.082
Well-10	467.49	476.006	482.231	475.242

Bcf billion cubic feet

Table 2 EUR of Well-07 and Well-10

Well	Blasingame (Bcf)	Agarwal–Gardner (Bcf)	Normalized pressure integral (Bcf)	Average (Bcf)
Well-07	303.061	303.93	306.682	304.558
Well-10	327.243	333.204	337.562	332.67

Bcf billion cubic feet

Table 3 Permeability (k) surrounding Well-07 and Well-10

Well	Blasingame (md)	Agarwal–Gardner (md)	Normalized pressure integral (md)	Average (md)
Well-07	3.0799	2.9880	3.0508	3.0396
Well-10	2.7761	2.7537	2.8218	2.7839

md millidarcy

Table 4 Skin effect for Well-07 and Well-10

Well	Blasingame	Agarwal–Gardner	Normalized pressure integral	Average
Well-07	7.019	7.018	7.013	7.017
Well-10	7.022	7.013	7.007	7.014

Imam (2013)also mentioned that Petrobangla published a revised estimate of the Habiganj gas field based on RPS energy consultant showing estimated GIIP value of UGS is 3.68 Tcf and EUR of 2.63 Tcf. This study found total estimated value of GIIP of these two wells to 910.324 Bcf and EUR to 637.228 Bcf. So, it can be deduced that 637.228 Bcf of gas is recoverable by primary recovery from proven reserve of 2.63 Tcf from the reservoir of Habiganj gas field, Bangladesh.

Conclusions

For the last few decades RTA, i.e., modern DCA, using typecurve is one of the developed and most used methods for analyzing petroleum reservoir. Averaging from three methods rate transient analyzing procedure, this study shows the estimated GIIP value of Well-07 and Well-10 of Habiganj gas field to 435.082 Bcf and 475.242 Bcf, respectively, while the value of EUR of Well-07 and Well-10 was amounted to 304.558 Bcf and 332.67 Bcf, respectively. The study shows the positive skin factor caused by reservoir damage for Well-07 and Well-10 was 7.017 and 7.014, reducing the value of formation permeability from 2–4 darcy to 3.0396 md and 2.7839 md near wellbore region. This decreasing permeability due to formation damage retards the expected flow of fluids and, hence, the production.

Acknowledgments The authors would like to be thankful to Petrobangla for their support for providing the required data to conduct this research.

Appendix 1

See Table 5 and Figs. 10, 11, 12.

Table 5 Production data of Well-07 for the year of 2007

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
January 2007			
1/1/2007	23.268	1600	4.101
1/2/2007	25.693	1555	4.296
1/3/2007	31.196	1545	4.516
1/4/2007	35.323	1542	4.164
1/5/2007	41.327	1525	4.755
1/6/2007	42.097	1486	4.875
1/7/2007	42.953	1468	4.894
1/8/2007	43.245	1437	5.573
1/9/2007	43.837	1412	5.548
1/10/2007	43.633	1414	5.12
1/11/2007	43.924	1411	5.183
1/12/2007	43.857	1411	5.164
1/13/2007	43.960	1410	5.259
1/14/2007	43.701	1414	5.101
1/15/2007	43.785	1413	4.995
1/16/2007	43.707	1414	8.423
1/17/2007	43.723	1414	7.831
1/18/2007	43.640	1415	7.561
1/19/2007	43.698	1414	7.819
1/20/2007	43.698	1414	7.876
1/21/2007	43.830	1413	7.787
1/22/2007	43.718	1414	7.781
1/23/2007	43.780	1413	7.63
1/24/2007	43.654	1414	7.813
1/25/2007	43.654	1414	7.787
1/26/2007	43.727	1414	5.133
1/27/2007	43.739	1414	9.064
1/28/2007	43.702	1414	8.247
1/29/2007	43.721	1414	7.769
1/30/2007	43.721	1414	5.026
1/31/2007	43.698	1414	5.089
February 2007			
2/1/2007	43.731	1414	5.775
2/2/2007	43.644	1415	5.837

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
2/3/2007	43.682	1414	7.586
2/4/2007	43.931	1412	6.882
2/5/2007	43.917	1412	6.737
2/6/2007	43.878	1412	5.925
2/7/2007	43.939	1412	6.051
2/8/2007	43.967	1411	5.429
2/9/2007	43.764	1413	5.548
2/10/2007	43.710	1414	4.894
2/11/2007	43.808	1413	5.02
2/12/2007	43.732	1414	5.429
2/13/2007	43.795	1413	6.02
2/14/2007	43.818	1413	5.894
2/15/2007	43.793	1413	5.101
2/16/2007	43.798	1413	4.938
2/17/2007	43.792	1413	5.391
2/18/2007	43.786	1413	4.888
2/19/2007	43.753	1413	6.611
2/20/2007	43.896	1412	5.221
2/21/2007	43.779	1413	5.385
2/22/2007	43.807	1413	5.265
2/23/2007	43.811	1413	8.159
2/24/2007	43.713	1414	6.58
2/25/2007	43.715	1414	6.278
2/26/2007	43.807	1413	6.12
2/27/2007	43.794	1413	6.196
2/28/2007	43.756	1413	5.309
March 2007			
3/1/2007	43.744	1416	6.014
3/2/2007	43.34	1418	5.315
3/3/2007	43.754	1420	6.095
3/4/2007	43.728	1421	5.718
3/5/2007	43.836	1420	5.8
3/6/2007	43.758	1420	5.674
3/7/2007	43.751	1420	5.73
3/8/2007	43.814	1420	5.611
3/9/2007	42.935	1425	5.498
3/10/2007	43.824	1420	5.227
3/11/2007	43.788	1420	5.101
3/12/2007	43.863	1419	5.819
3/13/2007	43.838	1420	5.624
3/14/2007	43.882	1419	5.762
3/15/2007	43.871	1419	5.397
3/16/2007	43.261	1422	3.535
3/17/2007	43.365	1421	6.479
3/18/2007	43.655	1421	5.63
3/19/2007	43.915	1420	5.598
3/20/2007	42.358	1420	7.775
3/21/2007	41.017	1436	5.68

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
3/22/2007	40.257	1445	7.926
3/23/2007	41.057	1443	7.756
3/24/2007	40.505	1450	5.309
3/25/2007	40.136	1455	4.642
3/26/2007	39.723	1458	4.711
3/27/2007	40.31	1452	5.076
3/28/2007	40.392	1451	7.97
3/29/2007	40.312	1452	4.56
3/30/2007	40.371	1451	4.636
3/31/2007	40.436	1451	6.064
April 2007			
4/1/2007	40.241	1459	6.429
4/2/2007	40.466	1456	6.429
4/3/2007	40.281	1458	6.429
4/4/2007	40.338	1458	6.429
4/5/2007	40.332	1458	6.429
4/6/2007	40.298	1458	6.429
4/7/2007	39.81	1463	6.429
4/8/2007	40.698	1455	6.429
4/9/2007	39.626	1465	6.429
4/10/2007	39.961	1461	6.429
4/11/2007	40.403	1457	6.429
4/12/2007	40.4	1457	6.429
4/13/2007	40.162	1459	6.429
4/14/2007	40.096	1460	6.429
4/15/2007	40.275	1458	6.429
4/16/2007	39.972	1461	6.429
4/17/2007	40.274	1458	6.429
4/18/2007	39.678	1462	6.429
4/19/2007	39.717	1462	6.429
4/20/2007	39.796	1461	6.429
4/21/2007	40.069	1460	6.429
4/22/2007	39.924	1462	6.429
4/23/2007	39.708	1464	6.429
4/24/2007	40.151	1459	6.429
4/25/2007	40.176	1459	6.429
4/26/2007	40.205	1459	6.429
4/27/2007	39.736	1463	6.429
4/28/2007	40.228	1459	6.429
4/29/2007	40.272	1458	6.429
4/30/2007	39.846	1463	6.429
May 2007			
5/1/2007	40.056	1459	4.06334
5/2/2007	40.267	1457	3.99415
5/3/2007	40.401	1456	4.4659
5/4/2007	40.139	1459	4.10108
5/5/2007	40.158	1458	4.32123
5/6/2007	40.334	1457	4.44074

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
5/7/2007	40.066	1459	4.11995
5/8/2007	40.271	1457	4.20172
5/9/2007	40.215	1458	4.36526
5/10/2007	40.053	1459	4.28349
5/11/2007	40.056	1459	4.30865
5/12/2007	40.113	1459	4.39671
5/13/2007	40.286	1457	4.20172
5/14/2007	40.310	1457	4.14511
5/15/2007	40.281	1457	4.27091
5/16/2007	40.293	1457	4.2143
5/17/2007	40.185	1458	4.09479
5/18/2007	40.219	1458	4.37784
5/19/2007	40.376	1456	3.95012
5/20/2007	40.278	1457	4.28349
5/21/2007	40.042	1460	4.23317
5/22/2007	40.282	1457	4.35897
5/23/2007	40.041	1460	4.24575
5/24/2007	40.331	1457	4.25833
5/25/2007	40.246	1458	4.09479
5/26/2007	40.240	1458	4.31494
5/27/2007	40.105	1459	4.30865
5/28/2007	40.231	1458	4.28978
5/29/2007	40.084	1459	4.17027
5/30/2007	39.996	1460	4.32752
5/31/2007	40.534	1459	3.35886
June 2007			
6/1/2007	40.166	1450	4.47219
6/2/2007	40.204	1440	4.61686
6/3/2007	40.095	1437	4.57912
6/4/2007	40.251	1436	4.79298
6/5/2007	40.278	1435	4.57912
6/6/2007	40.121	1437	4.5288
6/7/2007	40.128	1437	4.52251
6/8/2007	40.387	1434	4.70492
6/9/2007	40.293	1435	4.74895
6/10/2007	40.248	1436	4.63573
6/11/2007	40.331	1435	4.79298
6/12/2007	40.013	1438	4.52251
6/13/2007	40.244	1436	4.49106
6/14/2007	40.246	1436	4.56025
6/15/2007	40.229	1436	4.66718
6/16/2007	40.383	1434	4.79298
6/17/2007	40.392	1436	3.95641
6/18/2007	40.322	1435	3.94383
6/19/2007	40.478	1433	4.55396
6/20/2007	40.640	1432	4.75524
6/21/2007	40.455	1433	3.96899
6/22/2007	40.341	1435	4.50993

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
6/23/2007	40.298	1435	4.38413
6/24/2007	40.370	1434	4.30865
6/25/2007	40.513	1433	4.52251
6/26/2007	40.462	1433	4.31494
6/27/2007	40.414	1434	4.80556
6/28/2007	40.093	1437	4.77411
6/29/2007	40.324	1435	4.79298
6/30/2007	40.190	1436	4.74266
July 2007			
7/1/2007	40.154	1430	4.64831
7/2/2007	40.329	1425	4.55396
7/3/2007	40.337	1422	4.62315
7/4/2007	40.375	1420	4.54138
7/5/2007	40.353	1417	4.58541
7/6/2007	40.295	1415	4.63573
7/7/2007	40.342	1414	4.64831
7/8/2007	40.353	1413	4.81814
7/9/2007	40.324	1414	4.62944
7/10/2007	40.463	1412	4.64202
7/11/2007	40.458	1412	4.61686
7/12/2007	40.566	1411	4.62315
7/13/2007	40.412	1413	4.22688
7/14/2007	40.543	1412	4.52251
7/15/2007	40.453	1412	4.74266
7/16/2007	40.132	1416	4.74266
7/17/2007	40.419	1413	4.70492
7/18/2007	40.087	1416	4.73008
7/19/2007	40.117	1416	4.67976
7/20/2007	40.105	1416	4.64831
7/21/2007	40.164	1415	4.48477
7/22/2007	40.334	1414	4.51622
7/23/2007	39.840	1419	4.57283
7/24/2007	39.921	1418	4.56025
7/25/2007	39.694	1420	4.06334
7/26/2007	40.291	1414	4.76153
7/27/2007	40.130	1416	4.71121
7/28/2007	40.035	1417	4.49735
7/29/2007	39.953	1417	4.61057
7/30/2007	40.261	1414	4.49106
7/31/2007	40.239	1415	4.59799
August 2007			
8/1/2007	39.945	1430	4.37784
8/2/2007	40.235	1438	4.49106
8/3/2007	38.000	1456	4.1514
8/4/2007	40.151	1445	4.67347
8/5/2007	40.000	1445	4.61686
8/6/2007	39.846	1445	4.76153
8/7/2007	40.038	1456	4.56654

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
8/8/2007	39.955	1456	4.39671
8/9/2007	39.875	1457	4.69863
8/10/2007	40.094	1455	4.1514
8/11/2007	40.190	1456	4.28978
8/12/2007	40.023	1456	4.61057
8/13/2007	40.225	1454	4.7175
8/14/2007	39.832	1458	4.44074
8/15/2007	40.044	1456	4.52251
8/16/2007	40.109	1455	4.64202
8/17/2007	39.958	1456	4.74266
8/18/2007	40.010	1456	4.87475
8/19/2007	40.190	1454	4.70492
8/20/2007	40.296	1453	4.60428
8/21/2007	40.423	1452	4.73008
8/22/2007	40.042	1456	4.56654
8/23/2007	39.885	1457	4.42187
8/24/2007	40.083	1455	4.63573
8/25/2007	40.079	1455	4.64831
8/26/2007	40.206	1454	4.67976
8/27/2007	39.977	1456	4.50364
8/28/2007	39.958	1456	4.67976
8/29/2007	40.421	1452	4.05705
8/30/2007	40.324	1453	4.64831
8/31/2007	40.539	1451	4.63573
September 2007			
9/1/2007	40.262	1435	4.60428
9/2/2007	40.159	1425	4.64831
9/3/2007	40.267	1420	4.81814
9/4/2007	39.895	1418	4.73008
9/5/2007	40.457	1413	4.79298
9/6/2007	40.171	1411	4.71121
9/7/2007	40.040	1412	4.7804
9/8/2007	40.405	1410	5.54778
9/9/2007	40.270	1409	4.81814
9/10/2007	40.221	1410	4.49735
9/11/2007	40.331	1409	4.75524
9/12/2007	40.509	1407	4.69234
9/13/2007	40.469	1407	4.66718
9/14/2007	40.483	1407	4.64831
9/15/2007	40.425	1408	4.66089
9/16/2007	40.243	1410	4.49106
9/17/2007	40.512	1408	9.47903
9/18/2007	40.538	1407	8.96325
9/19/2007	40.081	1409	7.51655
9/20/2007	40.062	1409	4.83701
9/21/2007	40.566	1406	5.68616
9/22/2007	40.180	1410	3.82432
9/23/2007	40.052	1411	4.64831

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
9/24/2007	40.502	1407	4.93136
9/25/2007	40.130	1411	4.70492
9/26/2007	40.366	1408	4.69234
9/27/2007	40.229	1409	4.79298
9/28/2007	40.388	1408	4.88104
9/29/2007	40.133	1411	4.13253
9/30/2007	40.368	1408	4.43445
October 2007			
10/1/2007	40.855	1406	4.01931
10/2/2007	40.438	1408	4.70492
10/3/2007	40.227	1410	4.79927
10/4/2007	40.439	1408	4.56654
10/5/2007	40.102	1410	4.89991
10/6/2007	40.066	1411	4.98797
10/7/2007	40.563	1406	4.48477
10/8/2007	40.343	1409	4.66718
10/9/2007	40.459	1407	4.32752
10/10/2007	39.981	1412	4.56025
10/11/2007	39.914	1414	3.98786
10/12/2007	39.825	1415	4.39671
10/13/2007	36.469	1440	4.22059
10/14/2007	36.504	1440	4.13882
10/15/2007	33.905	1455	3.95641
10/16/2007	34.815	1450	4.11366
10/17/2007	39.416	1415	4.50364
10/18/2007	40.171	1411	4.23317
10/19/2007	39.917	1413	4.63573
10/20/2007	39.974	1412	4.68605
10/21/2007	40.001	1412	4.74266
10/22/2007	40.126	1411	4.07592
10/23/2007	39.999	1412	4.72379
10/24/2007	39.940	1413	4.63573
10/25/2007	39.822	1414	4.4659
10/26/2007	40.027	1412	4.41558
10/27/2007	40.213	1410	4.69234
10/28/2007	40.060	1411	4.76782
10/29/2007	40.081	1411	4.58541
10/30/2007	39.939	1413	4.76153
10/31/2007	40.399	1408	4.81814
November 2007			
11/1/2007	40.160	1425	4.64831
11/2/2007	40.205	1440	4.47219
11/3/2007	40.093	1454	4.70492
11/4/2007	39.964	1460	4.50364
11/5/2007	40.127	1464	4.45961
11/6/2007	39.986	1470	4.56654
11/7/2007	40.022	1475	4.69234
11/8/2007	39.947	1480	4.44074

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
11/9/2007	40.050	1486	4.61057
11/10/2007	40.138	1485	4.41558
11/11/2007	40.074	1485	4.42187
11/12/2007	39.945	1487	4.4659
11/13/2007	39.865	1487	4.45961
11/14/2007	40.139	1485	4.64831
11/15/2007	37.663	1493	2.78018
11/16/2007	38.099	1492	4.89991
11/17/2007	39.769	1488	4.42816
11/18/2007	40.361	1482	4.55396
11/19/2007	40.252	1483	4.67347
11/20/2007	40.187	1484	4.86217
11/21/2007	40.290	1483	4.61686
11/22/2007	40.198	1484	4.57912
11/23/2007	40.169	1484	4.44703
11/24/2007	40.422	1482	4.67976
11/25/2007	40.189	1484	4.57912
11/26/2007	40.156	1484	4.59799
11/27/2007	40.069	1485	4.72379
11/28/2007	40.234	1484	4.7804
11/29/2007	40.194	1484	4.70492
11/30/2007	40.264	1483	4.57283
December 2007			
12/1/2007	40.441	1482	4.57912
12/2/2007	40.316	1470	4.73637
12/3/2007	40.398	1465	4.18285
12/4/2007	40.380	1460	4.29607
12/5/2007	39.976	1455	4.42187
12/6/2007	39.892	1450	4.66718
12/7/2007	40.004	1446	4.61057
12/8/2007	39.379	1452	4.47848
12/9/2007	39.807	1448	4.61686
12/10/2007	39.580	1450	4.52251
12/11/2007	39.783	1448	4.58541
12/12/2007	40.164	1444	4.62944
12/13/2007	39.997	1446	4.41558
12/14/2007	40.424	1442	4.79298
12/15/2007	40.232	1444	4.54138
12/16/2007	40.015	1446	4.42187
12/17/2007	40.372	1442	4.45332
12/18/2007	40.364	1442	4.53509
12/19/2007	40.342	1443	4.50993
12/20/2007	36.723	1485	3.60417
12/21/2007	38.039	1479	3.75513
12/22/2007	38.698	1477	4.13253
12/23/2007	38.891	1470	4.44703
12/24/2007	39.896	1462	4.2143
12/25/2007	39.896	1449	5.84341

Table 5 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
12/26/2007	39.164	1455	4.403
12/27/2007	40.044	1446	4.83072
12/28/2007	39.872	1447	4.4659
12/29/2007	39.675	1449	4.61057
12/30/2007	36.418	1488	4.24575
12/31/2007	40.067	1445	4.66089

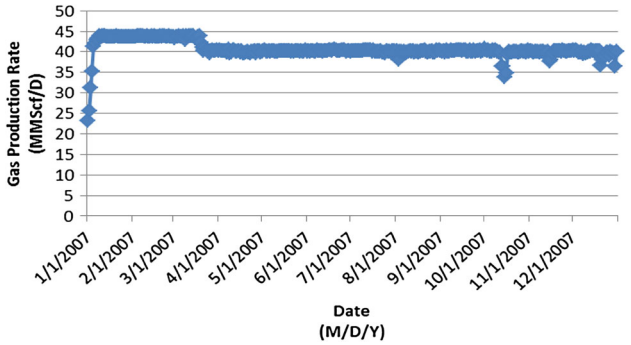

Fig. 10 Graphical presentation of gas production rate of Well-07 during the year of 2007

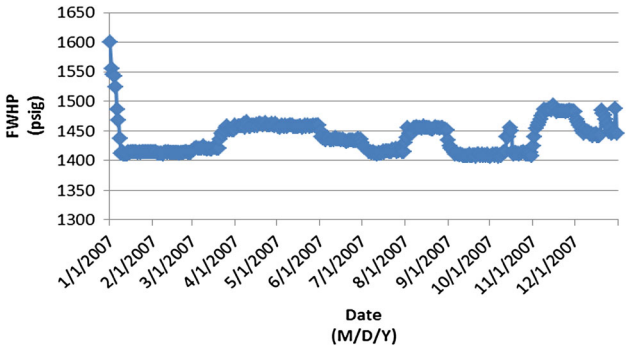

Fig. 11 Graphical presentation of flowing wellhead pressure (FWHP) of Well-07 during the year of 2007

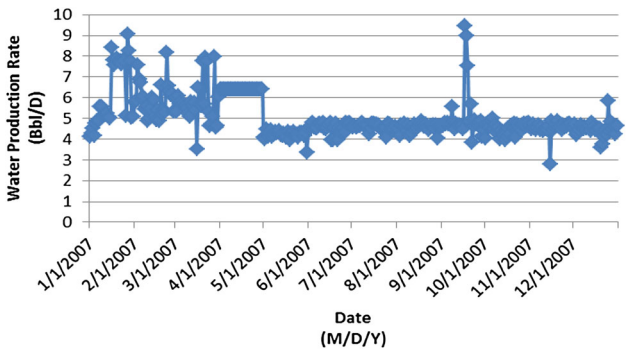

Fig. 12 Graphical presentation of water production rate of Well-07 during the year of 2007

Appendix 2

See Tables 6 and Figs. 13, 14, 15.

Table 6 Production data of Well-10 for the year of 2007

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
January 2007			
1/1/2007	23.004	1575	4.038
1/2/2007	25.402	1540	4.265
1/3/2007	30.842	1495	4.472
1/4/2007	34.922	1491	4.12
1/5/2007	40.858	1488	4.693
1/6/2007	41.619	1484	4.8
1/7/2007	42.466	1468	4.837
1/8/2007	42.754	1445	5.523
1/9/2007	43.349	1435	5.46
1/10/2007	43.147	1432	5.095
1/11/2007	43.435	1429	5.152
1/12/2007	43.369	1434	5.07
1/13/2007	43.470	1433	5.158
1/14/2007	43.215	1433	5.039
1/15/2007	43.298	1435	4.906
1/16/2007	43.221	1433	8.354
1/17/2007	43.237	1433	7.769
1/18/2007	43.154	1432	7.536
1/19/2007	43.211	1433	7.743
1/20/2007	43.212	1433	7.813
1/21/2007	43.343	1434	7.687
1/22/2007	43.231	1433	7.699
1/23/2007	43.293	1435	7.511
1/24/2007	43.168	1433	7.743
1/25/2007	43.168	1433	7.731
1/26/2007	43.241	1433	5.076
1/27/2007	43.252	1433	8.983
1/28/2007	43.215	1433	8.177
1/29/2007	43.235	1433	7.687
1/30/2007	43.234	1433	4.963
1/31/2007	43.214	1433	5.039
February 2007			
2/1/2007	43.245	1440	5.73
2/2/2007	43.158	1438	5.819
2/3/2007	43.196	1439	7.53
2/4/2007	43.325	1442	6.787
2/5/2007	43.311	1442	6.649
2/6/2007	43.273	1442	5.844
2/7/2007	43.333	1441	5.988
2/8/2007	43.360	1442	5.353
2/9/2007	43.755	1440	5.51
2/10/2007	43.701	1437	4.906
2/11/2007	43.798	1437	5.007
2/12/2007	43.723	1436	5.447
2/13/2007	43.786	1438	5.988
2/14/2007	43.809	1438	5.881
2/15/2007	43.783	1438	5.083
2/16/2007	43.788	1437	4.938
2/17/2007	43.783	1437	5.391
2/18/2007	43.776	1436	4.875
2/19/2007	43.743	1436	6.605
2/20/2007	43.886	1437	5.215
2/21/2007	43.769	1437	5.397
2/22/2007	43.797	1436	5.271
2/23/2007	43.801	1437	8.146
2/24/2007	43.704	1436	6.611
2/25/2007	43.705	1436	6.284
2/26/2007	43.798	1437	6.108
2/27/2007	43.784	1437	6.209
2/28/2007	43.746	1437	5.309
March 2007			
3/1/2007	43.734	1433	6.058
3/2/2007	43.33	1432	5.328
3/3/2007	43.744	1430	6.076
3/4/2007	43.719	1428	5.756
3/5/2007	43.827	1428	5.806
3/6/2007	43.748	1429	5.674
3/7/2007	43.742	1429	5.743
3/8/2007	43.804	1428	5.611
3/9/2007	42.926	1437	5.504
3/10/2007	43.815	1429	5.24
3/11/2007	43.778	1429	5.101
3/12/2007	43.853	1429	5.793
3/13/2007	43.829	1429	5.624
3/14/2007	43.872	1429	5.756
3/15/2007	43.862	1428	5.385
3/16/2007	43.252	1431	3.548
3/17/2007	43.355	1430	6.504
3/18/2007	43.646	1431	5.598
3/19/2007	43.905	1433	5.617
3/20/2007	42.348	1439	7.725
3/21/2007	41.008	1445	5.699
3/22/2007	40.248	1452	7.926
3/23/2007	40.108	1455	7.536
3/24/2007	40.505	1450	5.296
3/25/2007	40.136	1452	4.63
3/26/2007	39.723	1455	4.711
3/27/2007	40.31	1450	5.083
3/28/2007	40.392	1449	7.97

Table 6 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
3/29/2007	40.312	1450	4.554
3/30/2007	40.371	1449	4.642
3/31/2007	40.436	1449	6.064
April 2007			
4/1/2007	40.241	1486	4.498
4/2/2007	40.466	1490	4.592
4/3/2007	40.281	1490	4.749
4/4/2007	40.338	1489	4.485
4/5/2007	40.332	1491	4.441
4/6/2007	40.298	1490	5.397
4/7/2007	39.81	1495	4.724
4/8/2007	40.698	1488	4.233
4/9/2007	39.626	1497	4.925
4/10/2007	39.961	1496	3.585
4/11/2007	40.403	1491	3.843
4/12/2007	40.4	1489	4.347
4/13/2007	40.162	1493	1.963
4/14/2007	40.096	1492	4.328
4/15/2007	40.275	1492	4.24
4/16/2007	39.972	1493	4.221
4/17/2007	40.274	1492	3.825
4/18/2007	39.678	1498	6.919
4/19/2007	39.717	1496	4.542
4/20/2007	39.796	1495	4.661
4/21/2007	40.069	1493	4.227
4/22/2007	39.924	1496	4.636
4/23/2007	39.708	1497	4.397
4/24/2007	40.151	1494	4.623
4/25/2007	40.176	1494	4.9
4/26/2007	40.205	1493	4.825
4/27/2007	39.736	1495	4.523
4/28/2007	40.228	1491	4.743
4/29/2007	40.272	1491	4.661
4/30/2007	39.846	1495	4.598
May 2007			
5/1/2007	40.056	1485	4.37784
5/2/2007	40.267	1481	4.34639
5/3/2007	40.401	1478	4.92507
5/4/2007	40.139	1478	4.45332
5/5/2007	40.158	1481	4.68605
5/6/2007	40.334	1477	4.86217
5/7/2007	40.066	1479	4.47848
5/8/2007	40.271	1479	4.57912
5/9/2007	40.215	1480	4.73008
5/10/2007	40.053	1482	4.62315
5/11/2007	40.056	1481	4.66089
5/12/2007	40.113	1479	4.7804
5/13/2007	40.286	1478	4.56025

Table 6 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
5/14/2007	40.310	1479	4.52251
5/15/2007	40.281	1480	4.62315
5/16/2007	40.293	1478	4.58541
5/17/2007	40.185	1479	4.4659
5/18/2007	40.219	1479	4.74895
5/19/2007	40.376	1478	4.30236
5/20/2007	40.278	1480	4.62315
5/21/2007	40.041	1480	4.60428
5/22/2007	40.282	1478	4.76782
5/23/2007	40.041	1481	4.57912
5/24/2007	40.331	1477	4.69234
5/25/2007	40.246	1477	4.49735
5/26/2007	40.240	1479	4.70492
5/27/2007	40.105	1480	4.67976
5/28/2007	40.231	1477	4.67976
5/29/2007	40.084	1482	4.49106
5/30/2007	39.996	1481	4.67347
5/31/2007	40.534	1478	3.69852
June 2007			
6/1/2007	40.166	1485	4.4659
6/2/2007	40.204	1487	4.59799
6/3/2007	40.094	1490	4.56025
6/4/2007	40.251	1488	4.81185
6/5/2007	40.278	1488	4.56025
6/6/2007	40.121	1489	4.52251
6/7/2007	40.128	1488	4.5288
6/8/2007	40.387	1485	4.7175
6/9/2007	40.293	1486	4.76782
6/10/2007	40.248	1487	4.66089
6/11/2007	40.331	1488	4.7804
6/12/2007	40.013	1489	4.55396
6/13/2007	40.244	1488	4.49106
6/14/2007	40.245	1487	4.57283
6/15/2007	40.229	1486	4.69234
6/16/2007	40.383	1486	4.78669
6/17/2007	40.392	1484	3.96899
6/18/2007	40.322	1488	3.92496
6/19/2007	40.478	1487	4.5288
6/20/2007	40.640	1485	4.76782
6/21/2007	40.455	1487	3.95012
6/22/2007	40.341	1486	4.51622
6/23/2007	40.298	1488	4.37784
6/24/2007	40.370	1487	4.30865
6/25/2007	40.513	1485	4.52251
6/26/2007	40.462	1486	4.30865
6/27/2007	40.414	1487	4.81185
6/28/2007	40.093	1489	4.77411
6/29/2007	40.324	1487	4.78669

Table 6 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
6/30/2007	40.191	1488	4.74895
July 2007			
7/1/2007	40.154	1486	4.66089
7/2/2007	40.329	1481	4.56654
7/3/2007	40.337	1477	4.64202
7/4/2007	40.375	1477	4.54138
7/5/2007	40.353	1477	4.58541
7/6/2007	40.295	1478	4.64831
7/7/2007	40.342	1478	4.64831
7/8/2007	40.352	1477	4.82443
7/9/2007	40.324	1475	4.66718
7/10/2007	40.463	1477	4.62944
7/11/2007	40.458	1477	4.59799
7/12/2007	40.566	1478	4.5917
7/13/2007	40.412	1476	4.24575
7/14/2007	40.543	1477	4.49735
7/15/2007	40.453	1476	4.74895
7/16/2007	40.132	1479	4.74895
7/17/2007	40.419	1477	4.68605
7/18/2007	40.087	1481	4.71121
7/19/2007	40.117	1480	4.69234
7/20/2007	40.105	1481	4.64202
7/21/2007	40.164	1479	4.47219
7/22/2007	40.334	1476	4.54138
7/23/2007	39.840	1482	4.58541
7/24/2007	39.921	1480	4.59799
7/25/2007	39.694	1485	4.04447
7/26/2007	40.291	1479	4.74895
7/27/2007	40.130	1480	4.7175
7/28/2007	40.035	1481	4.50364
7/29/2007	39.953	1481	4.61686
7/30/2007	40.262	1478	4.49735
7/31/2007	40.239	1479	4.5917
August 2007			
8/1/2007	39.945	1477	4.40929
8/2/2007	40.235	1474	4.50993
8/3/2007	0.832	1675	0.73593
8/4/2007	0.000	1677	0.00
8/5/2007	26.272	1580	3.04436
8/6/2007	39.846	1479	4.7804
8/7/2007	40.038	1478	4.57283
8/8/2007	39.955	1480	4.37155
8/9/2007	39.875	1479	4.70492
8/10/2007	40.094	1478	4.13253
8/11/2007	40.190	1476	4.28349
8/12/2007	40.023	1478	4.61057
8/13/2007	40.224	1475	4.73008
8/14/2007	39.832	1481	4.42816

Table 6 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
8/15/2007	40.044	1476	4.55396
8/16/2007	40.109	1475	4.67976
8/17/2007	39.958	1478	4.73008
8/18/2007	40.010	1478	4.86217
8/19/2007	40.190	1476	4.69234
8/20/2007	40.296	1475	4.60428
8/21/2007	40.423	1473	4.74895
8/22/2007	40.042	1478	4.56025
8/23/2007	39.885	1481	4.39042
8/24/2007	40.083	1476	4.66089
8/25/2007	40.079	1477	4.64831
8/26/2007	40.206	1476	4.67347
8/27/2007	39.977	1478	4.50993
8/28/2007	39.958	1478	4.67976
8/29/2007	40.421	1475	4.03818
8/30/2007	40.324	1474	4.64202
8/31/2007	40.539	1472	4.64831
September 2007			
9/1/2007	40.262	1480	4.61686
9/2/2007	40.159	1485	4.62944
9/3/2007	40.267	1483	4.86217
9/4/2007	39.895	1489	4.7175
9/5/2007	40.457	1484	4.77411
9/6/2007	40.171	1486	4.71121
9/7/2007	40.040	1489	4.76153
9/8/2007	40.405	1484	5.55407
9/9/2007	40.270	1485	4.80556
9/10/2007	40.221	1486	4.48477
9/11/2007	40.331	1483	4.78669
9/12/2007	40.509	1484	4.66718
9/13/2007	40.469	1485	4.63573
9/14/2007	40.483	1482	4.66718
9/15/2007	40.425	1483	4.66718
9/16/2007	40.243	1485	4.50993
9/17/2007	40.512	1484	9.46016
9/18/2007	40.538	1482	8.98841
9/19/2007	40.081	1484	7.51026
9/20/2007	40.062	1485	4.81185
9/21/2007	40.566	1483	5.67358
9/22/2007	40.180	1485	3.82432
9/23/2007	40.051	1489	4.64202
9/24/2007	40.502	1484	4.91249
9/25/2007	40.130	1485	4.72379
9/26/2007	40.366	1484	4.70492
9/27/2007	40.229	1485	4.79298
9/28/2007	40.388	1484	4.88733
9/29/2007	40.133	1486	4.13253
9/30/2007	40.367	1485	4.42187

Table 6 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
October 2007			
10/1/2007	40.855	1483	4.01931
10/2/2007	40.438	1482	4.73008
10/3/2007	40.227	1484	4.82443
10/4/2007	40.439	1485	4.56654
10/5/2007	40.102	1486	4.89991
10/6/2007	40.066	1488	4.98168
10/7/2007	40.563	1485	4.45961
10/8/2007	40.343	1485	4.66718
10/9/2007	40.459	1484	4.32752
10/10/2007	39.981	1488	4.54767
10/11/2007	39.914	1489	3.9627
10/12/2007	39.825	1490	4.41558
10/13/2007	36.469	1525	4.20172
10/14/2007	36.504	1525	4.11995
10/15/2007	33.905	1540	3.97528
10/16/2007	34.814	1536	4.10737
10/17/2007	39.415	1494	4.52251
10/18/2007	40.171	1487	4.23317
10/19/2007	39.917	1489	4.64202
10/20/2007	39.974	1489	4.66089
10/21/2007	40.001	1488	4.74266
10/22/2007	40.126	1487	4.06334
10/23/2007	39.999	1490	4.69863
10/24/2007	39.940	1487	4.66089
10/25/2007	39.822	1490	4.4659
10/26/2007	40.027	1488	4.41558
10/27/2007	40.213	1486	4.68605
10/28/2007	40.060	1486	4.77411
10/29/2007	40.081	1489	4.56025
10/30/2007	39.939	1489	4.74895
10/31/2007	40.399	1484	4.81185
November 2007			
11/1/2007	40.160	1477	4.64831
11/2/2007	40.205	1475	4.48477
11/3/2007	40.093	1477	4.70492
11/4/2007	39.964	1478	4.50364
11/5/2007	40.127	1477	4.4659
11/6/2007	39.986	1477	4.57283
11/7/2007	40.022	1476	4.70492
11/8/2007	39.947	1479	4.44703
11/9/2007	40.050	1477	4.62944
11/10/2007	40.138	1474	4.44074
11/11/2007	40.074	1479	4.39671
11/12/2007	39.945	1477	4.49106
11/13/2007	39.865	1479	4.45961
11/14/2007	40.139	1474	4.69234
11/15/2007	37.663	1484	2.78647

Table 6 continued

Date (M/D/Y)	Gas (MMScf)	FWHP (psig)	Water (Bbl)
11/16/2007	22.321	1505	2.91856
11/17/2007	39.769	1481	4.41558
11/18/2007	40.361	1475	4.54138
11/19/2007	40.252	1475	4.66089
11/20/2007	40.187	1474	4.88104
11/21/2007	40.290	1475	4.60428
11/22/2007	40.198	1475	4.58541
11/23/2007	40.169	1476	4.45961
11/24/2007	40.422	1473	4.69863
11/25/2007	40.189	1477	4.57912
11/26/2007	40.156	1477	4.5917
11/27/2007	40.069	1476	4.74266
11/28/2007	40.234	1474	4.79927
11/29/2007	40.194	1477	4.69234
11/30/2007	40.263	1475	4.57912
December 2007			
12/1/2007	40.441	1473	4.58541
12/2/2007	40.316	1470	4.75524
12/3/2007	40.398	1469	4.18285
12/4/2007	40.380	1468	4.30236
12/5/2007	39.977	1474	4.42187
12/6/2007	39.892	1474	4.66718
12/7/2007	40.004	1473	4.59799
12/8/2007	39.379	1478	4.47848
12/9/2007	39.807	1475	4.61686
12/10/2007	39.580	1476	4.5288
12/11/2007	39.783	1474	4.60428
12/12/2007	40.164	1471	4.62315
12/13/2007	39.997	1472	4.42816
12/14/2007	40.424	1467	4.81185
12/15/2007	40.232	1468	4.56654
12/16/2007	40.015	1473	4.43445
12/17/2007	40.372	1468	4.47219
12/18/2007	40.364	1470	4.52251
12/19/2007	40.342	1467	4.54138
12/20/2007	36.723	1495	3.61046
12/21/2007	38.039	1492	3.76771
12/22/2007	38.698	1491	4.12624
12/23/2007	38.891	1490	4.42187
12/24/2007	39.896	1477	4.20172
12/25/2007	39.896	1473	5.86228
12/26/2007	39.164	1482	4.41558
12/27/2007	40.044	1472	4.8433
12/28/2007	39.872	1476	4.44074
12/29/2007	39.675	1478	4.60428
12/30/2007	36.419	1497	4.24575
12/31/2007	40.064	1473	4.6546

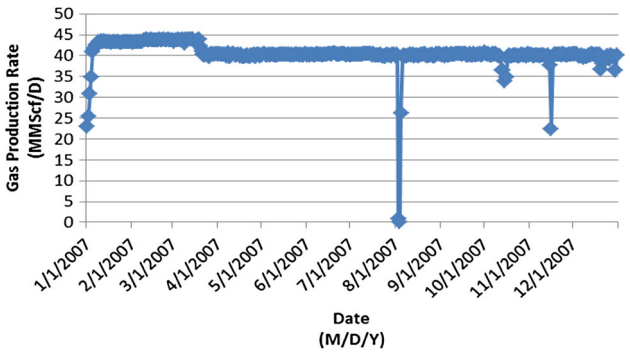

Fig. 13 Graphical presentation of gas production rate of Well-10 during the year of 2007

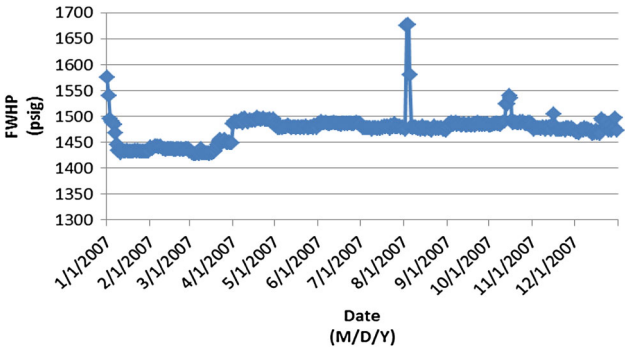

Fig. 14 Graphical presentation of flowing wellhead pressure (FWHP) of Well-10 during the year of 2007

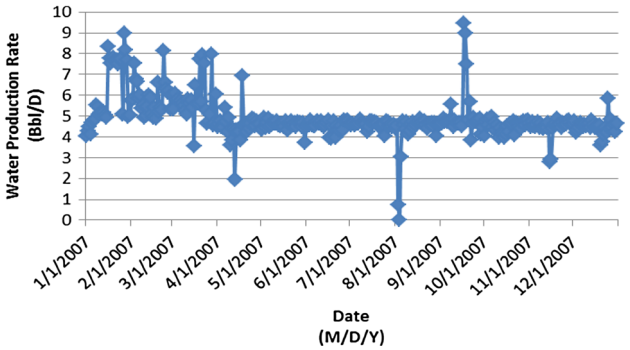

Fig. 15 Graphical presentation of water production rate of Well-10 during the year of 2007

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